NATIBO Project Background

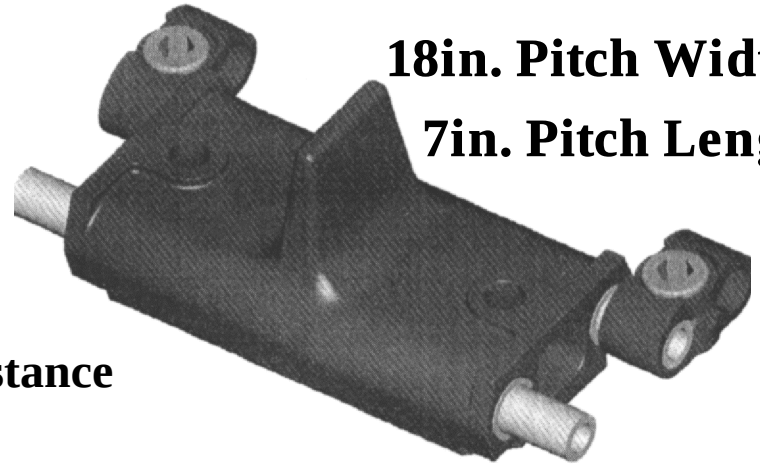
- General Motors Squeeze Casting Development
- ART Low Cost Whisker Development
- National Automotive Center Funded Effort
  - SiC Whiskers Production for Metal Matrix Composites
- NATIBO MMC Working Group Meetings
- Contract Awarded to Hughes Aircraft on 27 September 1995

Fabrication of Sturdy Preforms — **Improved Squeeze Casting** — **Lower Cost Manufacture of SiCw**

Synergistic Union of Three Newly Developed Processes to Manufacture Cost-Competitive SiCw Aluminum Metal Matrix Composites

NATIBO Base Program: BFV Track

- **Objective: Design & Test Track Shoes for a Bradley Fighting Vehicle (~35 tons GVW)**
- **Cost: $3.7M**
- **Duration: 36 Months**
- **Benefits:**
  - **Weight Reduction**
  - **Improved Abrasion Resistance**
  - **3000 mile Rubber Pad**
  - **Improved Bushing Life**
- **Hurdles: Retrofit Costs**
- **Potential Applications: M113 & Derivatives, AAAV, Future Vehicles**

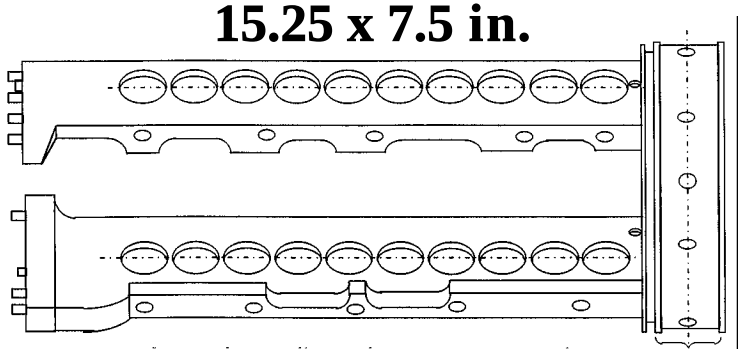


18in. Pitch Width

7in. Pitch Length

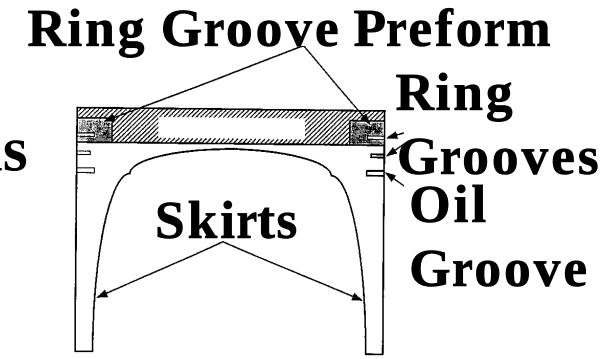
Option #1: AMRAAM Seeker Support Structure

- Design & Test AMRAAM Seeker Support Structure
- Cost: $1.6M
- Duration: 30 Months
- Benefits:
  - Significant Cost Savings over Titanium
  - Increased Durability in Ring Base
- Hurdles: None
- Potential Applications: Tomahawk, Standard Missile and Derivatives



Option #2: Diesel Piston Feasibility Study

- **Objective: To Investigate the Payoffs of MMCs for Diesel Pistons in HMMWV Engines**
- **Cost: Originally $920,000**
- **Duration: Originally 26 Months**
- **Benefits:**
  - **Reduced Air Pollution**
  - **Increased Mileage**
  - **Leverages Ongoing Commercial Piston Work at GMPTCO**
- **Hurdles: GM No Longer Makes HMMWV Engines**
- **Potential Applications: All Military Vehicles, Generators, Commercial Gasoline Pistons**



Technical Progress Since December 1996

- Basic Effort (Track Shoes)
  - Drawings are complete for shoe and other track parts/assembly
  - Samples for the material property tests have been fabricated
  - Thermal Ceramics Inc. has completed their dedicated whisker facility
- Option 1 (AMRAAM Seeker Support Structure)
  - Preliminary die design completed
  - 25 v% and 40 v% coupons produced for CTE and mechanical property testing
  - Casting design effort on-going at General Motors Powertrain
  - Die fill and solidification modeling in process
  - Preliminary tooling design sent to AAR-KEL
  - Machining trails in process (EDM is strongest candidate)
- Option 3 (Diesel Pistons)
  - Production of whiskers in process
  - 12 v% and 20 v% coupons fabricated for material testing
  - Design